

TEST REPORT

Applicant: TFIVE PTY LTD
Address: 10/29 Lorne Ave Killara NSW 2071 Australia
Equipment Type: LED Bulb T1 (Tunable White)
Model Name: LEDLBT1-L01
Brand Name: Aqara
Test Standard: AS CISPR 15:2017
Test Date: May 31, 2022 – Jun. 01, 2022
Date of Issue: Jul. 06, 2022

ISSUED BY:

Shenzhen BALUN Technology Co., Ltd.

Tested by: Xiong Chong

Checked by: Xia Long

Approved by: Liao Jianming
(Technical Director)

Xiong Chong

Xia Long

Jm Liao

Revision History

Version	Issue Date	Revisions
<u>Rev. 01</u>	<u>Jul. 06, 2022</u>	<u>Initial Issue</u>

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1 GENERAL INFORMATION

1.1 Identification of the Testing Laboratory

Company Name 1	Shenzhen BALUN Technology Co., Ltd.
Address	Block B, 1/F, Baisha Science and Technology Park, Shahe West Road, Nanshan District, ShenZhen, GuangDong Province, China
Phone Number	+86 755 6685 0100

1.2 Identification of the Responsible Testing Location

Test Location 1	Shenzhen BALUN Technology Co., Ltd.
Address 1	Block B, 1/F, Baisha Science and Technology Park, Shahe West Road, Nanshan District, ShenZhen, GuangDong Province, China
Description 1	Excepting Radiated Electromagnetic Disturbances (9 kHz - 30 MHz), all the other measurement facilities used to collect the measurement data are located at Block B, 1/F, Baisha Science and Technology Park, Shahe West Road, Nanshan District, ShenZhen, GuangDong Province, China

Test Location 2	Shenzhen CTL Testing Technology Co., Ltd.
Address 2	Block A, FL 1, Baisha Science and Technology Park, Shahe Xi Road, Nanshan District, ShenZhen, GuangDong Province, P. R. China
Description 2	Radiated Electromagnetic Disturbances (9kHz - 30MHz) measurement facilities used to collect the measurement data are located at Block A, FL 1, Baisha Science and Technology Park, Shahe Xi Road, Nanshan District, ShenZhen, GuangDong Province, P. R. China

2 PRODUCT INFORMATION

2.1 Applicant Information

Applicant	TFIVE PTY LTD
Address	10/29 Lorne Ave Killara NSW 2071 Australia

2.2 Manufacturer Information

Manufacturer	Lumi United Technology Co., Ltd
Address	Room 801-804, Building 1, Chongwen Park, Nanshan iPark, No. 3370, Liuxian Avenue, Fuguang Community, Taoyuan Residential District, Nanshan District, Shenzhen, China

2.3 Factory Information

Factory	N/A
Address	N/A

2.4 General Description for Equipment under Test (EUT)

EUT Type	LED Bulb T1 (Tunable White)
The Under Test Model Name	LEDLBT1-L01
Series Model Name	N/A
Description of Model name differentiation	N/A
Hardware Version	V2
Software Version	V30
Dimensions (Approx.)	N/A
Weight (Approx.)	N/A

2.5 Ancillary Equipment

Note: Not applicable.

2.6 Technical Information

Types of lamps and lanterns		Bluetooth, Zigbee
Interfaces present on the EUT	AC Ports	From AC power supply.
	DC Ports	No DC Ports
	I/O Ports	No I/O Ports
	Telecom Ports	No Tel ports.

3 SUMMARY OF TEST RESULTS

3.1 Test Standards

No.	Identity	Document Title
1	AS CISPR 15:2017	Limits and methods of measurement of radio disturbance characteristics of electrical lighting and similar equipment

3.2 Verdict

No.	Base Standard	Description		Verdict	Test Result	Remark
Emission						
1	AS CISPR 15	Insertion loss		N/A	Annex A.1	Note 1
2	AS CISPR 15	Disturbance voltages	Mains terminals	Pass	Annex A.2	--
			Load terminals	N/A		Note 2
			Control terminals	N/A		Note 3
3	AS CISPR 15	Radiated Electromagnetic Disturbances	9 kHz to 30 MHz	Pass	Annex A.3	--
			30 MHz to 300 MHz	Pass		--
Note 1: This test item applies only to include inductive ballast products, so this test item is not applicable.						
Note 2: The EUT with permanently connected load line, so this test item is not applicable.						
Note 3: The strength of the light of lamps and lanterns is not through an external device control, so this test item is not applicable.						

3.3 Test Uncertainty

The following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2. This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of $k=2$.

Measurement	Value
Conducted emissions (9 kHz-30 MHz)-AMN	3.22 dB
Conducted emissions (150 kHz-30 MHz)-AAN_CAT3	3.66 dB
Conducted emissions (150 kHz-30 MHz)-AAN_CAT5	4.10 dB
Conducted emissions (150 kHz-30 MHz)-AAN_CAT6	4.58 dB
Radiated emissions (30 MHz-1 GHz)-10m	4.80 dB
Radiated emissions (30 MHz-1 GHz)-966#2	4.76 dB
Radiated emissions (30 MHz-1 GHz)-966#4	4.38 dB
Radiated emissions (1 GHz-18 GHz)-10m	4.72 dB
Radiated emissions (1 GHz-18 GHz)-966#2	4.88dB
Radiated emissions (1 GHz-18 GHz)-966#4	5.04 dB

4 GENERAL TEST CONFIGURATIONS

4.1 Test Environments, Test Date and Test Engineer

Test items	Voltage	Temperature	Relative Humidity	Ambient Pressure	Test Date	Test Engineer
Disturbance voltages	AC 230 V/50 Hz	23.5°C	54%	101kPa	May 31, 2022	Wang Zejun
Radiated Electromagnetic Disturbances	AC 230 V/50 Hz	23.5°C	52%		May 31, 2022	Huang Zehuai

4.2 Test Equipment List

Radiated Emission Test For Frequency 9kHz - 30MHz						
Description	Manufacturer	Model	Serial No.	Cal. Date	Cal. Due	Use
EMI Receiver	ROHDE&SCHWARZ	ESCI	1165.5950.03	2022.05.06	2023.05.05	<input checked="" type="checkbox"/>
Triple-Loop Antenna	EVERFINE	LLA-2	1008002	2022.05.06	2023.05.05	<input checked="" type="checkbox"/>
Description	Name			Version		Use
Test Software	ES-K1			V1.71		<input checked="" type="checkbox"/>

Radiated Emission Test For Frequency 30MHz – 300MHz (10 m)						
Description	Manufacturer	Model	Serial No.	Cal. Date	Cal. Due	Use
EMI Receiver	ROHDE&SCHWARZ	ESRP	101036	2021.10.10	2022.10.09	<input checked="" type="checkbox"/>
Amplifier (30-1GHz)	COM-MV	ZT30-1000M	B2018054558	2021.10.10	2022.10.09	<input checked="" type="checkbox"/>
Test Antenna-Bi-Log	SCHWARZBECK	VULB 9168	9168-01162	2020.08.12	2023.08.11	<input checked="" type="checkbox"/>
Anechoic Chamber	EMC Electronic Co., Ltd	20.10*11.60*7.35m	N/A	2021.08.15	2024.08.14	<input checked="" type="checkbox"/>
Description	Manufacturer	Name		Version		Use
Test Software	BALUN	BL410-E		V19.918		<input checked="" type="checkbox"/>

Conducted disturbance Test						
Description	Manufacturer	Model	Serial No.	Cal. Date	Cal. Due	Use
EMI Receiver	KEYSIGHT	N9010B	MY57110309	2021.10.10	2022.10.09	<input checked="" type="checkbox"/>
LISN	SCHWARZBECK	NSLK 8127	8127-687	2021.06.08	2022.06.07	<input checked="" type="checkbox"/>
ISN	TESEQ	ISN T800	34449	2021.11.24	2022.11.23	<input type="checkbox"/>
ISN	TESEQ	ISN T8-Cat6	53561	2021.06.01	2022.05.31	<input type="checkbox"/>

Conducted disturbance Test						
Description	Manufacturer	Model	Serial No.	Cal. Date	Cal. Due	Use
Shielded Enclosure	YiHeng Electronic Co., Ltd	3.4m*3.1m*2.8m	N/A	2022.02.19	2025.02.18	<input checked="" type="checkbox"/>
Description	Manufacturer	Name		Version		Use
Test Software	BALUN	BL410-E		V19.918		<input checked="" type="checkbox"/>

4.3 Test Enclosure list

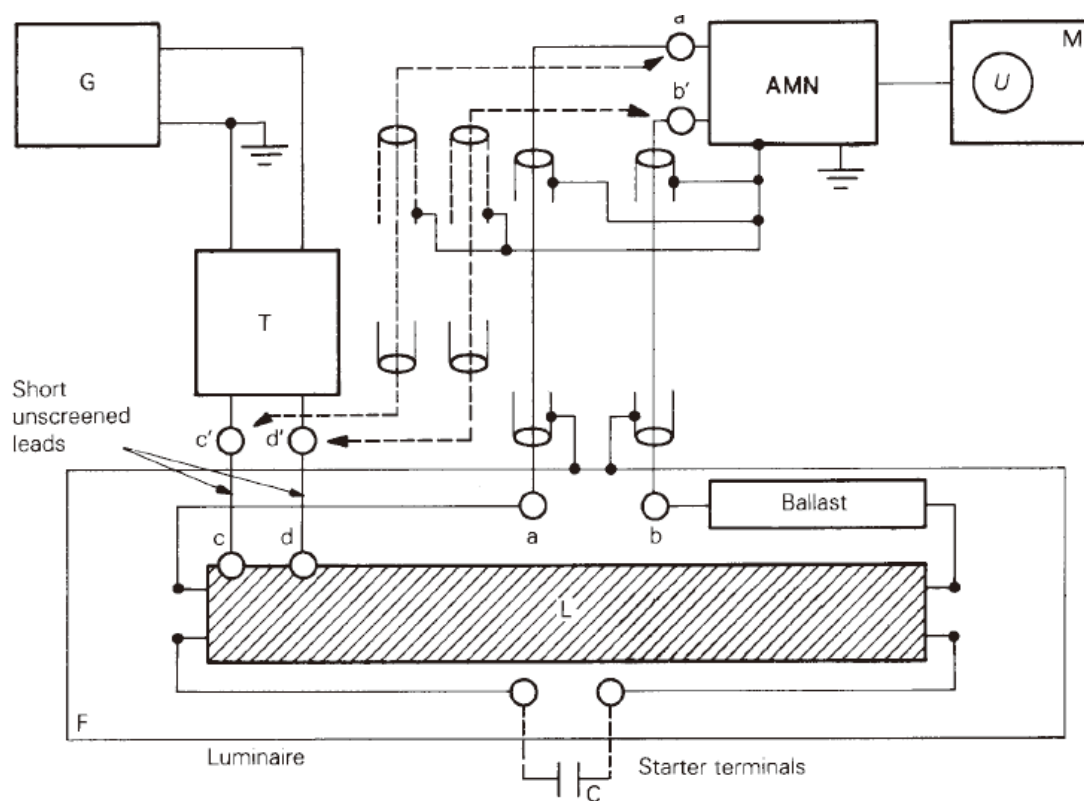
Description	Manufacturer	Model	Serial No.	Length	Description	Use
Power Cable	N/A	N/A	N/A	0.5 m	N/A	<input checked="" type="checkbox"/>

4.4 Test Configurations

Test Configurations (TC) No.	Description
TC01	<u>The Lighting Test Mode</u> EUT + Power Cable

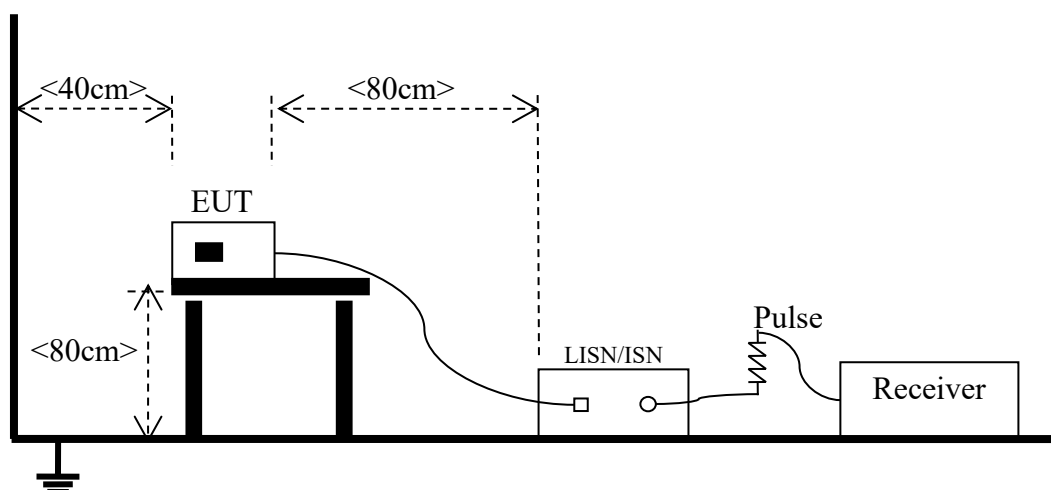
4.5 Description of Test Setup

Test Setup 1



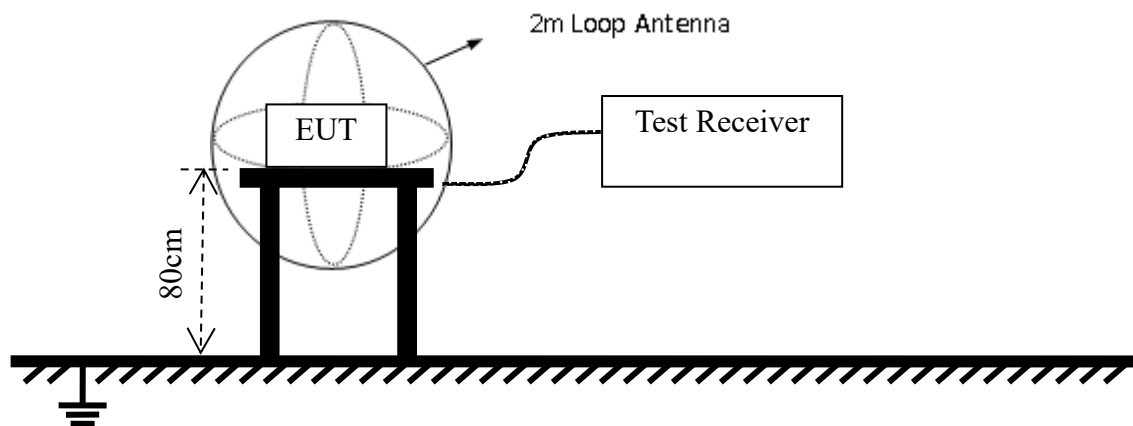
(For Insertion Loss)

Test Setup 2

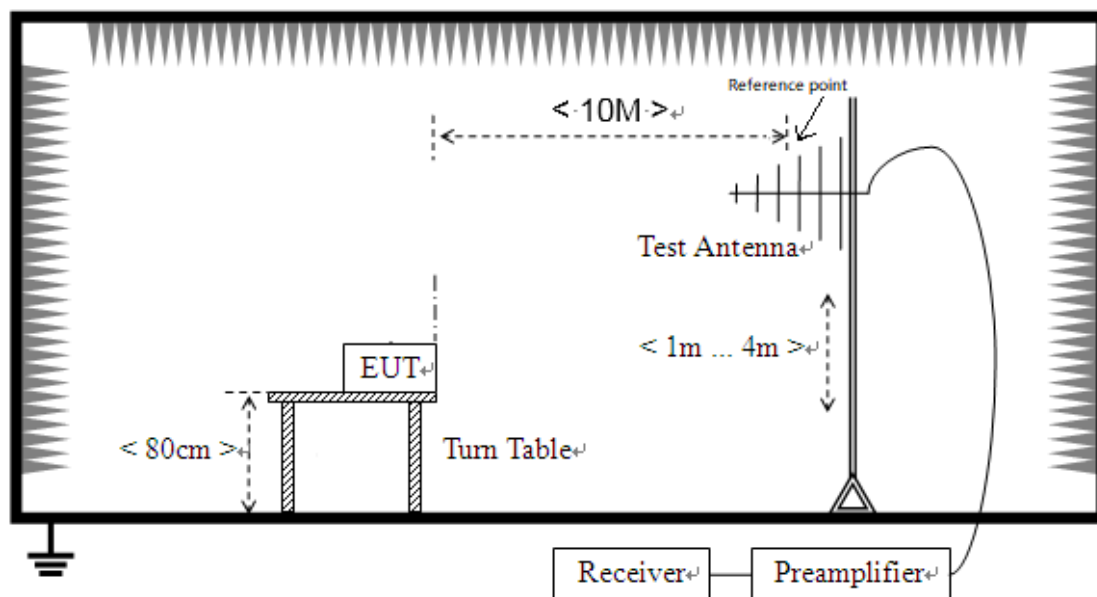


(For Disturbance voltages)

Test Setup 3



(For Radiated Electromagnetic Disturbances, 9 kHz to 30 MHz)



(For Radiated Electromagnetic Disturbances, 30 MHz to 300 MHz)

4.6 Test Conditions

Test Case	Test Conditions	
	Test Setup	Test Setup 2
Disturbance voltages	Test Configuration	TC01
	Test Setup	Test Setup 3
Radiated Electromagnetic Disturbances	Test Configuration	TC01
	Test Setup	Test Setup 3

5 TEST ITEMS

5.1 Emission Tests

5.1.1 Insertion loss

5.1.1.1 Test Limit

Frequency range (kHz)	Minimum values dB
150 - 160	28
160 - 1400	28 to 20
1400 - 1605	20

NOTE: The limit decreases linearly with the logarithm of the frequency in the range 160 kHz – 1400 kHz..

5.1.1.2 Test Procedure

Insertion loss through comparing voltage U1 and U2, voltage U1 by balanced/unbalanced converter connected to the output terminal of measurement between network terminal, U2 is produced by the balanced/unbalanced voltage converter connected to the network is obtained by measurement of lamps and lanterns.

5.1.1.3 Test Setup

Please refer to 4.5 section description of test setup of test setup 1. The photo of test setup please refer to ANNEX B.

5.1.1.4 Test Result

Please refer to ANNEX A.1.

5.1.2 Disturbance voltages

5.1.2.1 Test Limit

Mains terminals

Frequency range (MHz)	Conducted Limit (dB μ V)	
	Quasi-peak (dBuV)	Average(dBuV)
0.009 – 0.05	110	N/A
0.05 -0.15	90 to 80	N/A
0.15 - 0.50	66 to 56	56 to 46
0.50 - 5	56	46
5 - 30	60	50

NOTE:

- 1) At the transition frequency, the lower limit applies.
- 2) The limit decreases linearly with the logarithm of the frequency in the ranges 50 kHz to 150 kHz and 150 kHz to 0,5 MHz.
- 3) For electrodeless lamps and luminaires, the limit in the frequency range of 2,2 MHz to 3,0 MHz is 73 dB μ V quasi-peak and 63 dB μ V average.

Load terminals

Frequency range (MHz)	Conducted Limit (dB μ V)	
	Quasi-peak (dBuV)	Average(dBuV)
0.15– 0.50	84	70
0.50 -0.30	74	64

NOTE: At the transition frequency, the lower limit applies.

Control terminals

Frequency range (MHz)	Conducted Limit (dB μ V)	
	Quasi-peak (dBuV)	Average(dBuV)
0.15– 0.50	84 to 74	74 to 64
0.50 -0.30	74	64

NOTE:

- 1) The voltage disturbance limits are derived for use with an Asymmetric Artificial Network (AAN) which presents a common mode (asymmetric mode) impedance of 150 Ω to the control terminal.
- 2) The limit decreases linearly with the logarithm of the frequency in the range 0.15 - 0.50 MHz.

5.1.2.2 Test Setup

Please refer to 4.5 section description of test setup of test setup 2. The photo of test setup please refer to ANNEX B.

5.1.2.3 Test Procedure

The EUT is connected to the power mains through a LISN which provides 50Ω/50μH of coupling impedance for the measuring instrument. The test frequency range is from 150 kHz to 30MHz. The maximum conducted interference is searched using Peak (PK), Quasi-peak (QP) and Average (AV) detectors; the emission levels that are more than the AV and QP limits, and that have narrow margins from the AV and QP limits will be re-measured with AV and QP detectors. Tests for both L phase and N phase lines of the power mains connected to the EUT are performed. Telecommunication port was checked to find out the maximum conducted emission.

5.1.2.4 Test Result

Please refer to ANNEX A.2.

5.1.3 Radiated Electromagnetic Disturbances

5.1.3.1 Limit

9 kHz to 30 MHz

Frequency range (MHz)	Limits for loop diameter (dB μ A)
0.009 – 0.07	88
0.07 – 0.15	88 ~ 58 ^{Note}
0.15 – 2.2	58 ~ 22 ^{Note}
2.2 – 3.0	58
3.0 – 30	22

NOTE:

- 1) The limit is applicable at 2m loop diameter.
- 2) The lower limit shall apply at the transition frequency.
- 3) Decreasing linearly with logarithm of the frequency.

30 MHz to 300 MHz

Frequency range (MHz)	Quasi-Peak Limit (dB μ V/m)
30 - 230	40
230 - 1000	47

NOTE:

- 1) The limit is applicable at 3m measurement distance.
- 2) The lower limit shall apply at the transition frequency.
- 3) Additional provisions may be required for cases where interference occurs.

5.1.3.2 Test Setup

Please refer to 4.5 section description of test setup of test setup 3. The photo of test setup please refer to ANNEX B.

5.1.3.3 Test Procedure

The EUT is placed on a wood table in the center of a loop antenna.

The induced current in the loop antenna is measured by means of a current probe and the test receiver. Three field components is checked by means of a coax switch.

The frequency range from 9 kHz to 30MHz is investigated. The receiver is measured with the quasi-peak detector. For frequency band 9 kHz to 150 kHz, the bandwidth of the field strength meter is set at 200Hz. For frequency band 150 kHz to 30MHz, the bandwidth is set at 10 KHz.

An initial pre-scan was performed in the chamber using the EMI Receiver in peak detection mode. Quasi-peak measurements were conducted based on the peak sweep graph. The EUT was measured above 30 MHz by Bi-Log antenna with 2 orthogonal polarities.

5.1.3.4 Test Result

Please refer to ANNEX A.3.

ANNEX A TEST RESULTS

A.1 Insertion loss

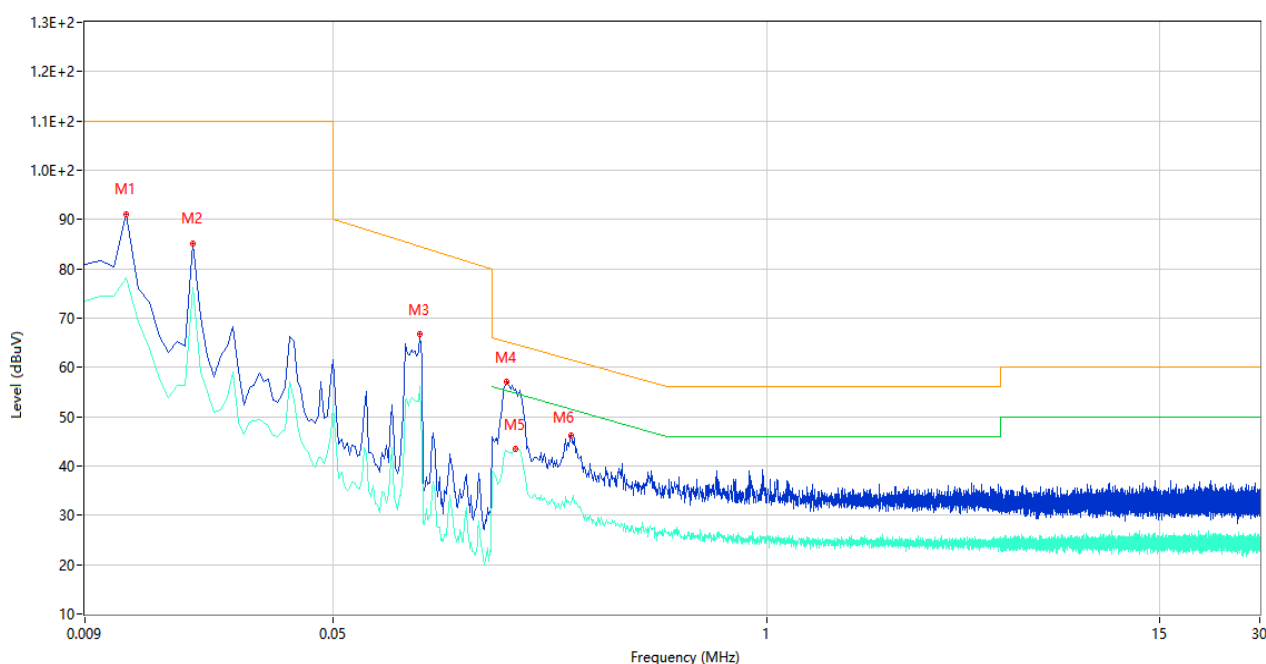
Note: Not Applicable

A.2 Disturbance Voltages

Test Data and Plots (Mains terminals)

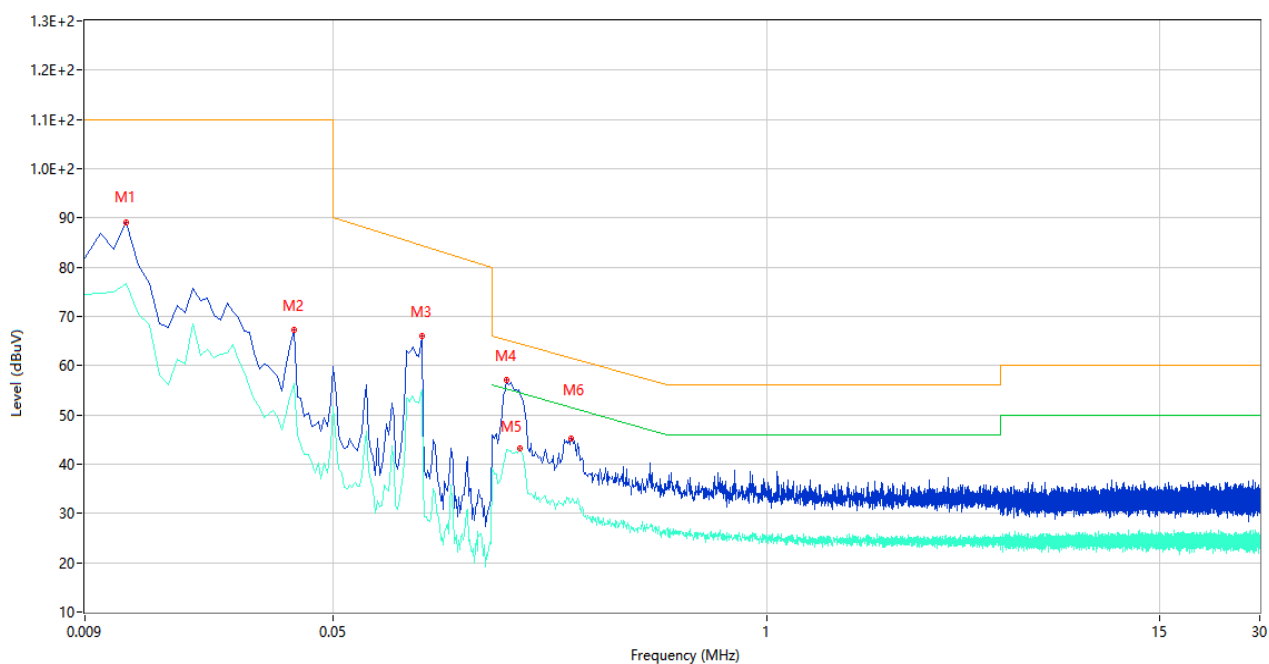
The worst test mode: The Lighting Test Mode

A.2.1 L Phase



No.	Frequency (MHz)	Results (dBuV)	Factor (dB)	Limit (dBuV)	Over Limit (dB)	Detector	Line	Verdict
1	0.012	91.16	11.57	110.00	-18.84	Peak	L	Pass
1**	0.012	78.29	11.57	--	--	AV	L	N/A
2	0.019	85.13	11.56	110.00	-24.87	Peak	L	Pass
2**	0.019	76.15	11.56	--	--	AV	L	N/A
3	0.091	66.75	11.33	84.55	-17.80	Peak	L	Pass
3**	0.091	56.05	11.33	--	--	AV	L	N/A
4	0.166	57.01	10.98	65.16	-8.15	Peak	L	Pass
4**	0.166	43.00	10.98	55.16	-12.16	AV	L	Pass
5	0.176	55.68	10.98	64.67	-8.99	Peak	L	Pass
5**	0.176	43.37	10.98	54.67	-11.30	AV	L	Pass
6	0.258	46.17	10.91	61.50	-15.33	Peak	L	Pass
6**	0.258	32.88	10.91	51.50	-18.62	AV	L	Pass

A.2.2 N Phase



No.	Frequency (MHz)	Results (dBuV)	Factor (dB)	Limit (dBuV)	Over Limit (dB)	Detector	Line	Verdict
1	0.012	89.19	11.57	110.00	-20.81	Peak	N	Pass
1**	0.012	76.62	11.57	--	--	AV	N	N/A
2	0.038	67.27	11.52	110.00	-42.73	Peak	N	Pass
2**	0.038	56.26	11.52	--	--	AV	N	N/A
3	0.092	66.08	11.33	84.45	-18.37	Peak	N	Pass
3**	0.092	55.06	11.33	--	--	AV	N	N/A
4	0.166	57.10	10.98	65.16	-8.06	Peak	N	Pass
4**	0.166	42.92	10.98	55.16	-12.24	AV	N	Pass
5	0.182	54.32	10.97	64.39	-10.07	Peak	N	Pass
5**	0.182	43.23	10.97	54.39	-11.16	AV	N	Pass
6	0.258	45.30	10.91	61.50	-16.20	Peak	N	Pass
6**	0.258	32.20	10.91	51.50	-19.30	AV	N	Pass

A.3 Radiated Electromagnetic Disturbances

Note 1: The symbol of "--" in the table which means not application.

Note 2: Measurements shall be made with a quasi-peak measuring receiver in the frequency range 9 kHz to 300 MHz.

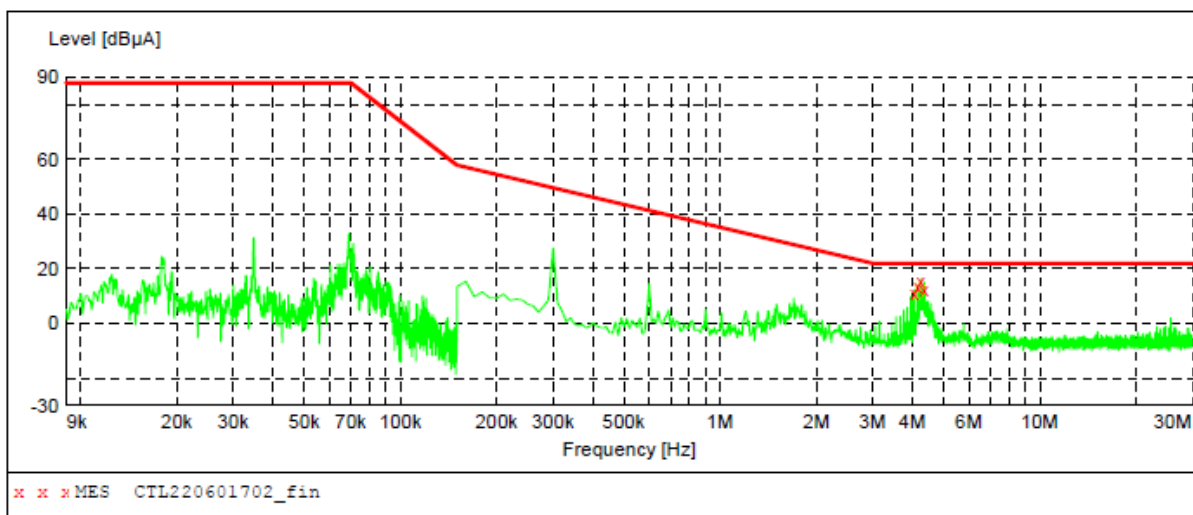
Note 3: To reduce the testing time, a peak measuring receiver may be used instead of a quasi-peak measuring receiver. In case of dispute, measurement with a quasi-peak measuring receiver will take precedence. As the peak value is too low against the limit, so the Quasi-peak value has been omitted.

Test Data and Plots (9KHz - 30 MHz)

The worst test mode: The Lighting Test Mode

A.3.1 Test Antenna LOOP X

SCAN TABLE: "Magnetic test fin"
Short Description: EN55015 Triple Loop



MEASUREMENT RESULT: "CTL220601702_fin"

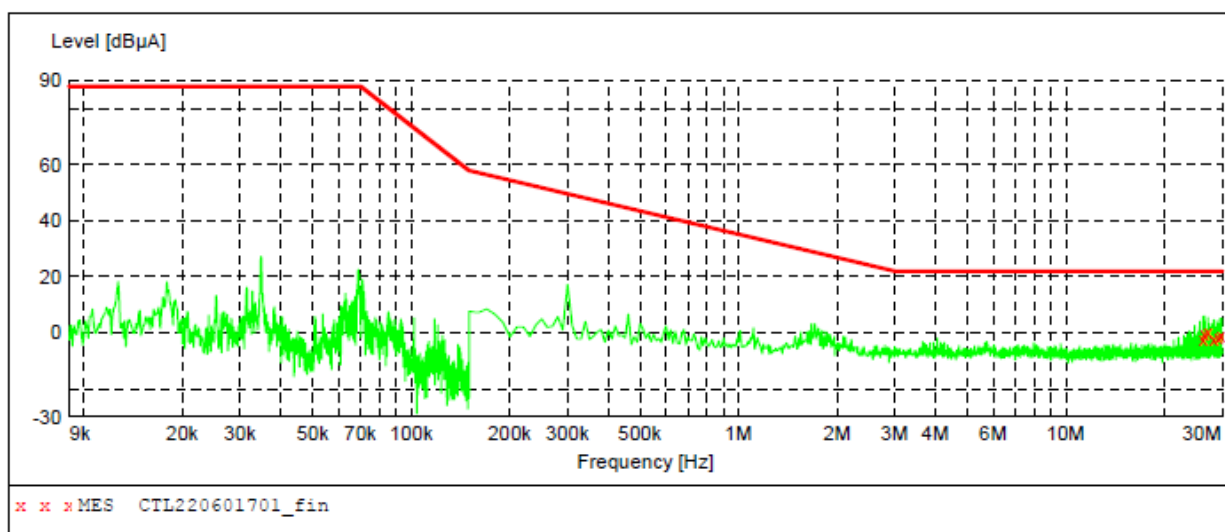
6/1/2022 4:27PM

Frequency MHz	Level dBμA	Transd dB	Limit dBμA	Margin dB	Det.	Loop	Azimuth deg
4.050000	10.80	0.0	22	11.2	QP	X	0.00
4.150000	13.30	0.0	22	8.7	QP	X	0.00
4.250000	15.30	0.0	22	6.7	QP	X	0.00
4.350000	12.50	0.0	22	9.5	QP	X	0.00

A.3.2 Test Antenna LOOP Y

SCAN TABLE: "Magnetic test fin"

Short Description: EN55015 Triple Loop

**MEASUREMENT RESULT: "CTL220601701_fin"**

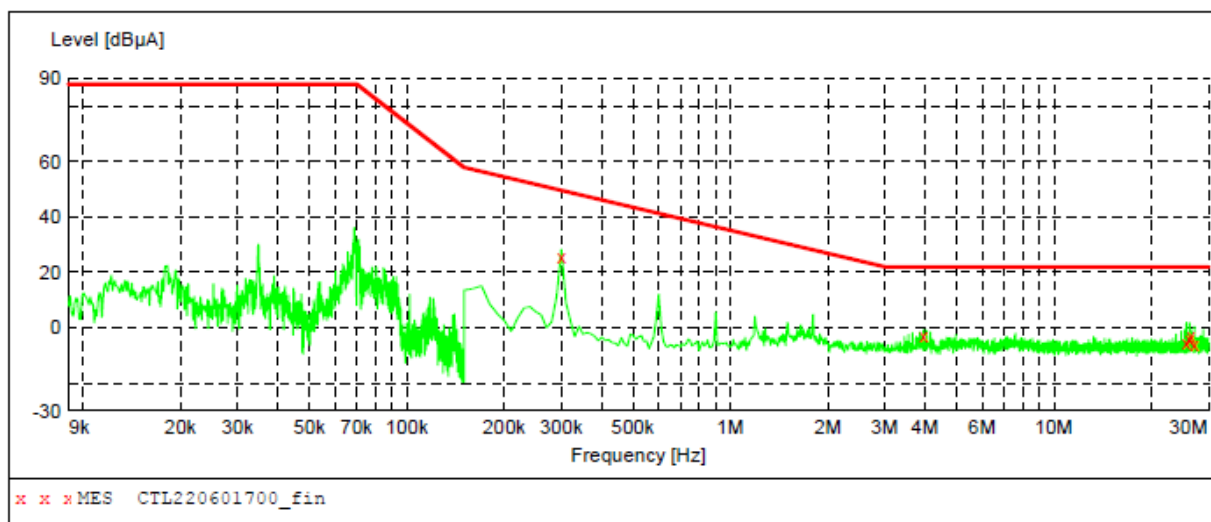
6/1/2022 4:25PM

Frequency MHz	Level dBμA	Transd dB	Limit dBμA	Margin dB	Det.	Loop	Azimuth deg
26.250000	-2.60	0.0	22	24.6	QP	Y	0.00
26.550000	-0.30	0.0	22	22.3	QP	Y	0.00
27.150000	0.10	0.0	22	21.9	QP	Y	0.00
28.350000	-2.30	0.0	22	24.3	QP	Y	0.00
29.250000	-2.00	0.0	22	24.0	QP	Y	0.00
29.840000	-1.00	0.0	22	23.0	QP	Y	0.00

A.3.3 Test Antenna LOOP Z

SCAN TABLE: "Magnetic test fin"

Short Description: EN55015 Triple Loop

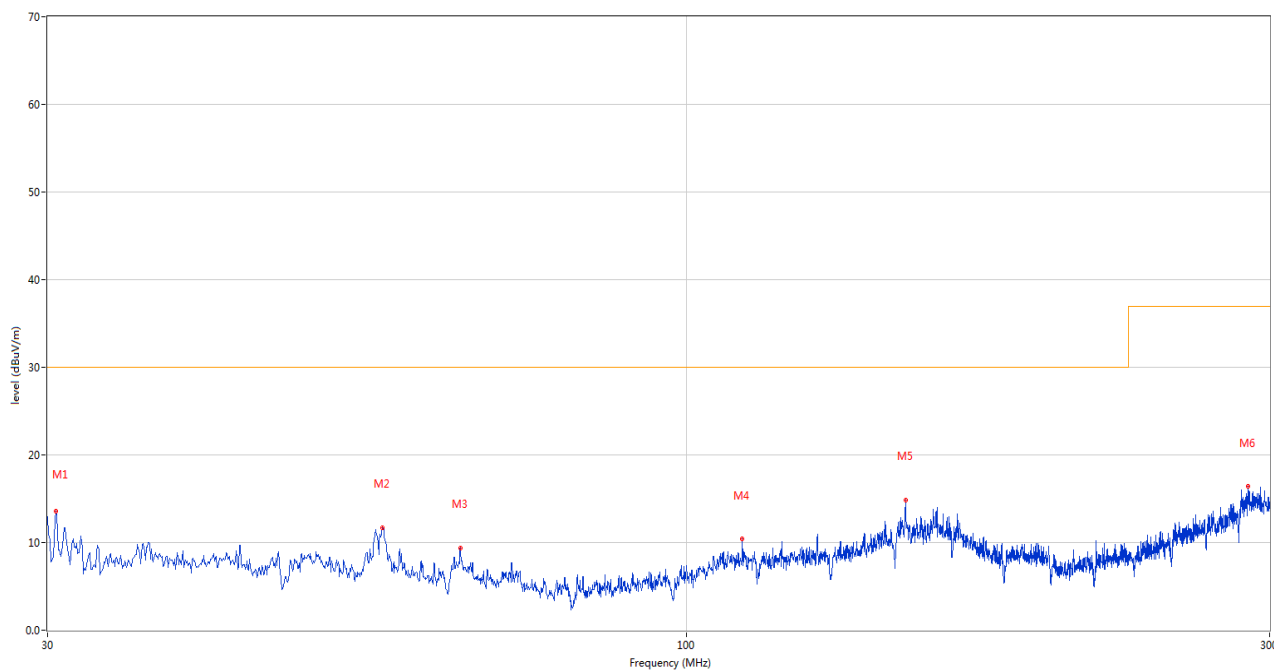
**MEASUREMENT RESULT: "CTL220601700_fin"**

6/1/2022 4:21PM

Frequency MHz	Level dBμA	Transd dB	Limit dBμA	Margin dB	Det.	Loop	Azimuth deg
0.300000	25.50	0.0	50	24.2	QP	Z	0.00
3.950000	-2.80	0.0	22	24.8	QP	Z	0.00
25.650000	-5.20	0.0	22	27.2	QP	Z	0.00
26.250000	-4.10	0.0	22	26.1	QP	Z	0.00
26.550000	-2.70	0.0	22	24.7	QP	Z	0.00
27.150000	-6.10	0.0	22	28.1	QP	Z	0.00

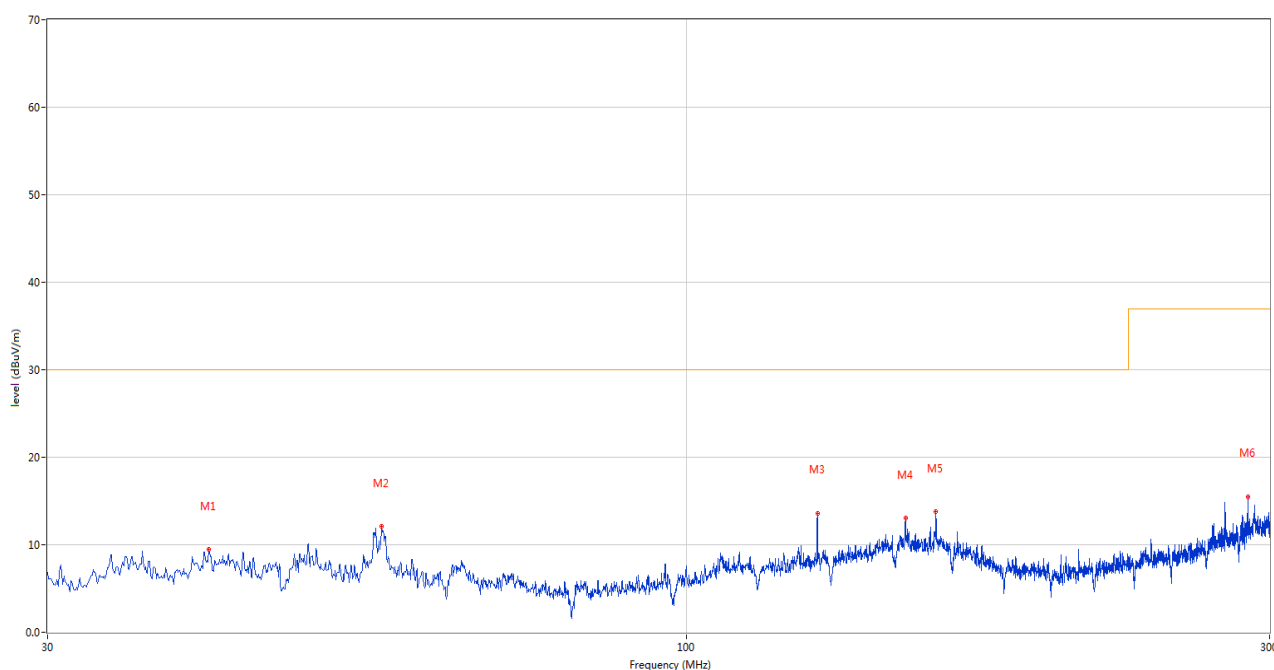
Test Data and Plots (Above 30 MHz)

A.3.4 Test Antenna Vertical, 30 MHz – 300 MHz



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Over Limit (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	30.472	13.55	-27.18	30.0	-16.45	Peak	176.00	100	Vertical	Pass
2	56.386	11.72	-27.51	30.0	-18.28	Peak	45.00	100	Vertical	Pass
3	65.294	9.41	-28.68	30.0	-20.59	Peak	360.00	200	Vertical	Pass
4	111.115	10.38	-28.76	30.0	-19.62	Peak	280.00	200	Vertical	Pass
5	151.065	14.81	-25.62	30.0	-15.19	Peak	277.00	100	Vertical	Pass
6	287.988	16.39	-25.97	37.0	-20.61	Peak	80.00	100	Vertical	Pass

A.3.5 Test Antenna Horizontal, 30 MHz – 300 MHz



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Over Limit (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	40.662	9.44	-26.62	30.0	-20.56	Peak	271.00	100	Horizontal	Pass
2	56.318	12.08	-27.49	30.0	-17.92	Peak	261.00	100	Horizontal	Pass
3	127.986	13.62	-27.33	30.0	-16.38	Peak	360.00	200	Horizontal	Pass
4	151.132	13.04	-25.62	30.0	-16.96	Peak	211.00	100	Horizontal	Pass
5	159.973	13.77	-25.58	30.0	-16.23	Peak	0.00	200	Horizontal	Pass
6	287.988	15.51	-25.97	37.0	-21.49	Peak	215.00	200	Horizontal	Pass

ANNEX B TEST SETUP PHOTOS

Please refer the document “BL-SZ2240344-AE.PDF”.

ANNEX C EUT EXTERNAL PHOTOS

Please refer the document “BL-SZ2240344-AW.PDF”.

ANNEX D EUT INTERNAL PHOTOS

Please refer the document “BL-SZ2240344-AI.PDF”.

Statement

1. The laboratory guarantees the scientificity, accuracy and impartiality of the test, and is responsible for all the information in the report, except the information provided by the customer. The customer is responsible for the impact of the information provided on the validity of the results.
2. The report without China inspection body and laboratory Mandatory Approval (CMA) mark has no effect of proving to the society.
3. For the report with CNAS mark or A2LA mark, the items marked with "☆" are not within the accredited scope.
4. This report is invalid if it is altered, without the signature of the testing and approval personnel, or without the "inspection and testing dedicated stamp" or test report stamp.
5. The test data and results are only valid for the tested samples provided by the customer.
6. This report shall not be partially reproduced without the written permission of the laboratory.
7. Any objection shall be raised to the laboratory within 30 days after receiving the report.

--END OF REPORT--